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It is very probable that the changes in toxicity in neoarsphenamine are due to oxidative processes occurring within the ampule. If the changes that occur are of such nature, they would likely be very similar to those described by Hunt[1] recently for aqueous solutions of arsphenamine; that is, that arsphenamine in solution first becomes more toxic upon cleavage of the arseno group and less toxic upon further oxidation of the cleavage products from the trivalent to the pentavalent form. Lots which were found to have decreased in solubility, therefore, may have passed through a more toxic stage during the progress of their deterioration.

### Conclusions.

1. Commercial neoarsphenamine is a relatively unstable substance in ampule.
2. Age, heat, and incomplete drying of the substance before ampuling are factors in causing deterioration in commercial neoarsphenamine.
3. The deterioration of neoarsphenamine is shown by changes in color, mobility in ampule, toxicity, solubility, and odor.
4. The results of the experiments suggest (*a*) that inasmuch as neoarsphenamine may deteriorate within a short time after manufacture, and in order to secure further data on its keeping properties, the date of manufacture might be given on the label of all lots issued; (*b*) that neoarsphenamine should be kept under conditions similar to those required for vaccines; that is, at ice-box temperature.

## BIOLOGICAL PRODUCTS.

### ESTABLISHMENTS LICENSED FOR THE PROPAGATION AND SALE OF VIRUSES, SERUMS, TOXINS, AND ANALOGOUS PRODUCTS.

The following table contains a list of the establishments holding licenses issued by the Treasury Department in accordance with the act of Congress approved July 1, 1902, entitled "An act to regulate the sale of viruses, serums, toxins, and analogous products in the District of Columbia, to regulate interstate traffic in said articles, and for other purposes."

The licenses granted to the following establishments for the products mentioned do not imply an indorsement of the claims made by the manufacturers for their respective preparations. The granting of a license means that inspections of the establishment concerned and laboratory examinations of samples of its products are made regularly to insure the observance of safe methods of manufacture, to ascertain freedom from contamination, and to determine the potency of diphtheria antitoxin, tetanus antitoxin, antidysenteric serum, antimeningococcic serum, antipneumococcic serum, bacterial vaccines, prepared from typhoid bacillus, paratyphoid bacillus A, paratyphoid bacillus B, and diphtheria toxin–antitoxin mixture, the only products for which potency standards or tests have been established.

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[1] Hunt, Reid, Some Factors Relating to the Toxic Action of Arsphenamine: Jour. Am. Med. Assoc., 1921, vol. 76, p. 854.

The enumeration of the products is as follows: Serums are placed first, the antitoxins, being the older and more important, heading the list. The other products are arranged generally in the order of their origin. The items in each class are arranged alphabetically.

## Establishments Licensed and Products for which Licenses have been Issued.

### AMERICAN ESTABLISHMENTS.

Parke, Davis & Co., Detroit, Mich.—License No. 1:

Diphtheria antitoxin; tetanus antitoxin; antianthrax serum; antidysenteric serum; antigonococcic serum; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; hemostatic serum (Lapenta); normal horse serum; thyroidectomized horse serum; vaccine virus; rabies vaccine (Cumming); tuberculin old; tuberculin T. R.; tuberculin B. E.; tuberculin B. F.; bacterial vaccines made from acne bacillus, acne diplococcus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, prodigiosus bacillus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; diphtheria toxin-antitoxin mixture; pollen extract; modified bacterial derivatives made from colon bacillus, gonococcus, paratyphoid bacillus A, paratyphoid bacillus B, pneumococcus, pyocyaneus bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus.

H. K. Mulford Co., Philadelphia, Pa.—License No. 2:

Diphtheria antitoxin; tetanus antitoxin; perfringens antitoxin; antianthrax serum; antidysenteric serum; antigonococcic serum; antimelitensis serum; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; normal horse serum; vaccine virus; rabies vaccine; tuberculin old; tuberculin T. R.; tuberculin B. E.; tuberculin B. F.; tuberculin proteose-free (Lyons); bacterial vaccines made from acne bacillus, cholera vibrio, colon bacillus, dysentery bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, micrococcus melitensis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, plague bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; sensitized bacterial vaccines made from acne bacillus, cholera vibrio, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptocccous, and typhoid bacillus; diphtheria toxin-antitoxin mixture; pollen extract.

Slee Laboratories, Swiftwater, Pa.—License No. 6:

Diphtheria antitoxin; tetanus antitoxin; normal horse serum; vaccine virus; bacterial vaccines made from acne bacillus, colon bacillus, gonococcus, paratyphoid bacillus A, paratyphoid bacillus B, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus.

The Cutter Laboratory, Berkeley, Calif.—License No. 8:

Diphtheria antitoxin; tetanus antitoxin; antianthrax serum; antigonococcic serum; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; normal horse serum; vaccine virus; rabies vaccine; tuberculin old; tuberculin B. F.; bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus carrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus.

Bureau of Laboratories, Department of Health, New York City.—License No. 14:

Diphtheria antitoxin; tetanus antitoxin; antimeningococcic serum; antipneumococcic serum; normal horse serum; vaccine virus; rabies vaccine; tuberculin old; and bacterial vaccines made from gonococcus, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; diphtheria toxin-antitoxin mixture.

Lederle Antitoxin Laboratories, Pearl River, N. Y.—License No. 17:

Diphtheria antitoxin; tetanus antitoxin; antianthrax serum; antidysenteric serum; antigonococcic serum; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; normal horse serum; vaccine virus; rabies vaccine; tuberculin old; tuberculin B. E.; tuberculin B. F.; bacterial vaccines made from acne bacillus, cholera vibrio, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, plague bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, streptococcus, and typhoid bacillus; diphtheria toxin-antitoxin mixture; pollen extract.

Bacterio-Therapeutic Laboratory, Asheville, N. C.—License No. 23:

Watery extract of tubercle bacilli (von Ruck); modified tubercle bacillus derivative (von Ruck).

Dr. G. H. Sherman, East Jefferson Avenue, Detroit, Mich.—License No. 30:

Bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, nonvirulent tubercle bacillus, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus.

Hygienic Laboratory, California State Board of Health, Berkeley, Calif.—License No. 40:

Rabies vaccine.

The Abbott Laboratories, 4735 East Ravenswood Avenue, Chicago, Ill.—License No. 43:

Bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; pollen extract.

Beebe Laboratories, St. Paul, Minn.—License No. 45:

Diphtheria antitoxin; tetanus antitoxin; bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, ozena bacillus, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus.

Dr. W. T. McDougall, 640 Minnesota Avenue, Kansas City, Kans.—License No. 49:

Rabies vaccine.

St. Louis Pasteur Institute, 3514 Lucas Avenue, St. Louis, Mo.—License No. 50:

Rabies vaccine (dilution method).

The Upjohn Co., Kalamazoo, Mich.—License No. 51:

Bacterial vaccines made from colon bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pneumococcus, psuedodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; pollen extract.

E. R. Squibb & Sons' Research and Biological Laboratories, New Brunswick, N. J.—License No. 52:

Diphtheria antitoxin; tetanus antitoxin; antigonococcic serum; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; normal horse serum; vaccine virus; rabies vaccine; bacterial vaccines made from acne bacillus, colon bacillus, dysentery bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, pyocyaneus bacillus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, streptococcus, and typhoid bacillus; leucocytic extract from the horse; diphtheria toxin-antitoxin mixture; arsphenamine; neoarsphenamine; sodium arsphenamine; solution of arsphenamine.

Laboratory of Clinical Pathology, 1208 Wyandotte Street, Kansas City, Mo.—License No. 53:

Rabies vaccine.

Dr. James McI. Phillips, 2057 North High Street, Columbus, Ohio.—License No. 54:

Rabies vaccine (dilution method).

Eli Lilly & Co., Indianapolis, Ind.—License No. 56:

Diphtheria antitoxin; tetanus antitoxin; antistreptococcic serum; normal horse serum; normal sheep serum; vaccine virus; rabies vaccine (Harris); tuberculin old; tuberculin T. R.; tuberculin B. E.; tuberculin B. F.; bacterial vaccines made from acne bacillus, cholera vibrio, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, plague bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; diphtheria toxin-antitoxin mixture.

Swan Myers Co., 219 North Senate Avenue, Indianapolis, Ind.—License No. 58:

Bacterial vaccines made from acne bacillus, colon bacillus, Friendländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, micrococcus tetragenus, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylcccccus albus, staphylococcus aureus, streptococcus, and typhoid bacillus.

Gilliland Laboratories, Ambler, Pa.—License No. 63:

Diphtheria antitoxin; tetanus antitoxin; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; normal horse serum; vaccine virus; rabies vaccine; tuberculin old; tuberculin B. E.; tuberculin B. F.; bacterial vaccine made from acne bacillus, gonococcus, influenza bacillus, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; diphtheria toxin-antitoxin mixture.

Antitoxin and Vaccine Laboratory, Department of Public Health, Commonwealth of Massachusetts, Forest Hills, Boston 30, Mass.—License No. 64:

Diphtheria antitoxin; antimeningococcic serum; antipneumococcic serum; vaccine virus; bacterial vaccines made from paratyphoid bacillus A, paratyphoid bacillus B, and typhoid bacillus; diphtheria toxin-antitoxin mixture.

United States Standard Products Co., Woodworth, Wis.—License No. 65:

Diphtheria antitoxin; tetanus antitoxin; normal horse serum; bacterial vaccines made from paratyphoid bacillus A, paratyphoid bacillus B, and typhoid bacillus; diphtheria toxin-antitoxin mixture.

D. L. Harris Laboratories, Metropolitan Building, St. Louis, Mo.—License No. 66:

Rabies vaccine (Harris).

The Arlington Chemical Co., Yonkers, N. Y.—License No. 67:

Bacterial vaccines made from colon bacillus, micrococcus tetragenus, pneumococcus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, streptococcus; pollen extract; animal epidermal extract; animal food extract; vegetable food extract.

Dermatological Research Laboratories, Philadelphia, Pa.—License No. 68:

Arshhenamine; neoarsphenamine.

H. A. Metz Laboratories, 122 Hudson Street, New York City.—License No. 69:

Arsphenamine; neoarsphenamine; sodium arsphenamine; silver arsphenamine.

Synthetic Drugs and Diarsenol Laboratories, Buffalo, N. Y.—License No. 70:

Arsphenamine; neoarsphenamine; sodium arsphenamine.

Hynson, Westcott, & Dunning, Baltimore, Md.—License No. 76:

Suspension of arsphenamine.

Mallinckrodt Chemical Works, St. Louis, Mo.—License No. 77:

Arsphenamine.

Empire State Chemical Laboratories, Brooklyn, N. Y.—License No. 78:

Arsphenamine.

## FOREIGN ESTABLISHMENTS.

Institut Pasteur de Paris, Paris, France.—License No. 11. Selling agents for the United States: Pasteur Laboratories of America, 366 West Eleventh Street, New York City:

Diphtheria antitoxin; tetanus antitoxin; antianthrax serum; antidysenteric serum; antiplague serum; antistreptococcic serum; bacterial vaccines made from cholera vibrio, plague bacillus, staphylococcus albus, and staphylococcus aureus.

Swiss Serum and Vaccine Institute, Berne, Switzerland.—License No. 21. Selling agents for the United States: C. Bischoff and Co., 451 Washington St., New York City:

Tetanus antitoxin; antidysenteric serum· antigonococcic serum; antimeningococcic serum; antiplague serum; antistreptococcic serum; tuberculin, old; bacterial vaccines made from cholera vibrio, colon bacillus, gonococcus, influenza bacillus, plague bacillus, pneumococcus, staphylococcus aureus, streptococcus, and typhoid bacillus.

Farbwerke Hoechst, vorm. Meister Lucius und Brüning, Hoechst am Main, Germany.—License No. 24. Selling agents for the United States: H. A. Metz Laboratories, 122 Hudson St., New York City:

Diphtheria antitoxin; normal horse serum; tuberculin old; tuberculin T. R.; tuberculin B. E.; tuberculin B. F.; bacterial vaccines made from cholera vibrio, staphylococcus albus, staphylococcus aureus, and staphylococcus citreus; typhoid bacillus; arsphenamine; neoarsphenamine; sodium arsphenamine; silver arsphenamine.

Inoculation Department, St. Mary's Hospital, London, England.—License No. 48. Selling agents for the United States: Parke Davis and Co., Detroit, Mich.:

Bacterial vaccines made from acne bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, and streptococcus; pollen extract.

Connaught Antitoxin Laboratories, University of Toronto, Toronto, Canada.—License No. 73:

Diphtheria antitoxin; tetanus antitoxin.

Les Establissements Poulenc Freres, 92 Rue Vielle-du-Temple, Paris III , France.—License No. 74. Selling agents for the United States: Powers-Weightman-Rosengarten Co., Philadelphia, Pa.:

Arsphenamine; neoarsphenamine.

Laboratoires Naline, Villaneuve-la-Garenne, Seine, France.—License No. 75. Selling agents for the United States: Geo. J. Wallau, 6 Cliff St., New York City:

Phospharsenamine.